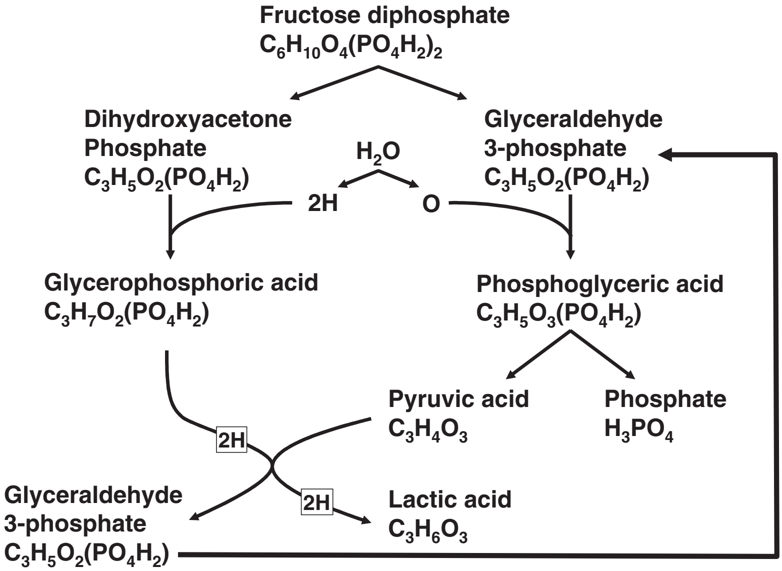

Figure 3.9. A representation of how Embden conceptualized the process of glycolysis as involving phosphorylated compounds throughout. Fructose diphosphate is first scissioned into two triosephosophates, one of which, glyceraldehyde-3-phosophate, is oxidized while the other, dihydroxyacetone phosphate, is reduced. The oxidation product, phosphoglyceric acid, then surrenders its phosphate to produce pyruvic acid. For muscle glycolysis, the product of the reduction, glycerophosphoric acid, is then oxidized at the expense of reducing pyruvic acid to lactic acid, yielding more glyceraldehyde-3-phosphate, which can reenter the reaction at an earlier step.

suggested that Harden and Young's discovery of the need for phosphates in order to maintain fermentation in a cell-free environment might reflect a more fundamental feature of glycolysis. In a paper published posthumously, Embden (Embden, Deuticke, & Kraft, 1933) produced a scheme for muscle glycolysis, illustrated in Figure 3.9, in which phosphorylated forms of several three-carbon sugars served as intermediaries. The key step in the pathway was the oxidation of one of the triosephosphate molecules to 3-phosphoglyceric acid at the expense of the reduction of the other to glycerophosphoric acid. Embden did not discuss the significance of the product of oxidation being phosphorylated, but in the next year Jacob Parnas proposed that the phosphate was not simply liberated, but transferred to phosphocreatine (Parnas, Ostern, & Mann, 1934).[37] (It was later determined that in fact it is transferred to ADP.)

[37] Parnas commented, "... the resynthesis of phosphocreatine and adenosine triphosphate is not linked to glycolysis as a whole, but to definite partial processes: and this leads further to the

https://doi.org/10.1017/CBO9781139164962.004 Published online by Cambridge University Press